



National Aeronautics and
Space Administration

Twenty-fifth Anniversary
1958-1983

FOREWORD

This year marks a major milestone for the National Aeronautics and Space Administration: its silver anniversary. It seems appropriate, on this occasion, to sum up how NASA has responded to the legislative charter that established the agency.

Among the responsibilities the Congress assigned NASA in the National Aeronautics and Space Act of 1958 were these:

- preservation of U.S. leadership in aerospace science and technology;
- cooperation with other nations in the peaceful application of technology;
- expansion of human knowledge of phenomena in the atmosphere and in space;
- pursuit of the practical benefits to be gained from aeronautical and space activities.

There can be no doubt that NASA's quarter century of effort has preserved the nation's leadership role and strengthened its posture in aerospace science and technology.

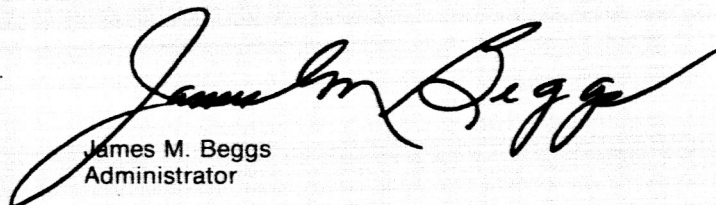
As for international cooperation, NASA has—since its inception—fostered the concept that the fruits of civil space research are to be shared with all mankind. The agency has provided technical assistance to scores of nations and has actively promoted cooperative ventures; indeed, virtually every major NASA space project today boasts some degree of foreign participation.

In the last 25 years, man has learned more about his planet, the near-Earth environment and the universe than in all the prior years of history. NASA's space science program has spearheaded this great expansion of human knowledge.

And, from the beginning, NASA has vigorously pursued the practical benefits that aerospace research offers. The agency pioneered in weather, communications and Earth resources survey satellites, the prime examples of space technology applied for Earth benefit, and it has built a broad base for expanding into new applications, some of which promise direct benefits of exceptional order. In aeronautical research, NASA has contributed in substantial degree to safer, better performing, more efficient, more environmentally acceptable aircraft. In support of the national energy program, NASA has

successfully applied its technical expertise to development of alternative sources of energy and new ways to conserve it. Finally, the technology generated in all these mainline areas of research has been reapplied, literally thousands of times, to produce a broad range of indirect benefits, or spinoffs.

Thus, the response to the Congressional mandate of 1958 has been impressive. The people of NASA can be justly proud of the dramatic accomplishments made possible by their dedicated labors. But they were not alone; their partners in progress include many thousands of others in industry, in the academic community and in other government agencies. I extend an anniversary salute to all who played a part in making NASA's first quarter century an era of unparalleled technological advance that contributed in great measure to our nation's social and economic future.

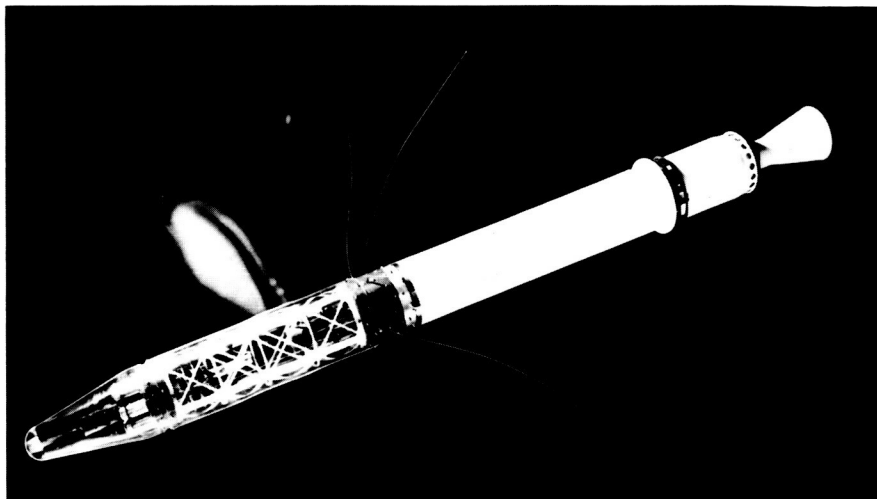


James M. Beggs
Administrator

National Aeronautics and
Space Administration

REFLECTIONS ON A SILVER ANNIVERSARY

NASA's 25 years of aerospace research have produced a wealth of scientific gain and a bountiful harvest of benefits to Earth's people



A 31-pound tapered cylinder, Explorer 1, the first U.S. satellite, discovered one of two radiation belts encircling Earth. Launched January 31, 1958 by the Army Ballistic Missile Agency, it was subsequently turned over to NASA.

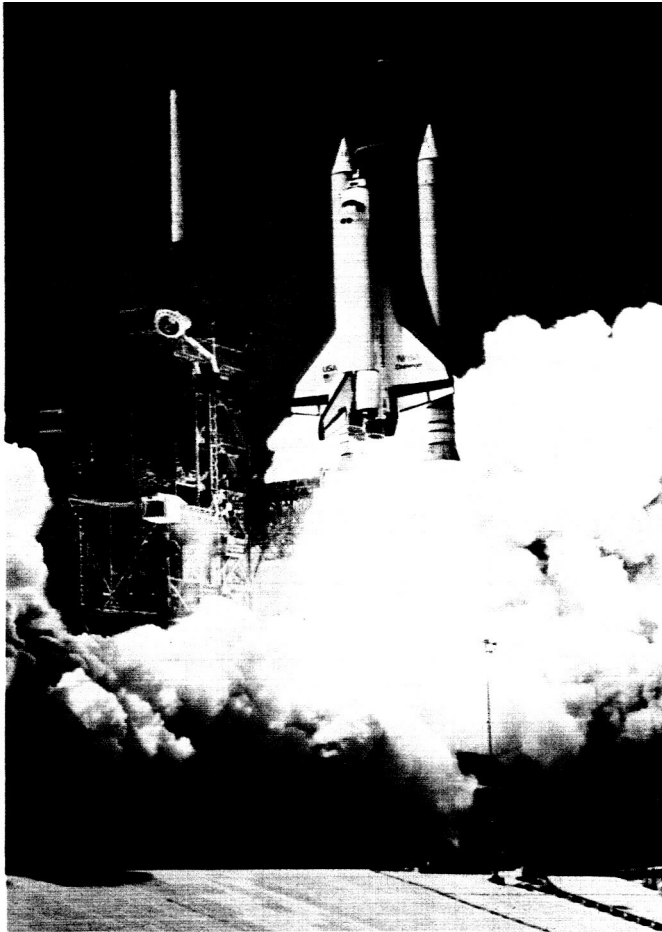
The Tilt Rotor Research Aircraft is representative of a wide range of aeronautical research projects conducted by NASA, independently or jointly with other organizations, in 25 years of aerospace progress.

An anniversary is a time for retrospection, for reviewing the past as prelude to the future. As NASA marks its 25th year, it is fitting to recall the dramatic aerospace happenings of the last quarter century and reflect upon their contributions to our mode of life.

It began on October 1, 1958; that was the first official day of NASA's existence. Ten days later, NASA launched its first spacecraft; the agency already had an ongoing aeronautical research program, inherited from a predecessor organization.

The initial years were difficult, marred by many failures and "partial successes" as the fledgling agency sought to find firm footing on the new and uncertain ground of space exploration. But in time the growing pain subsided and NASA became an organization known for its exceptional competence and imaginative management, the spearhead of a U.S. technological thrust of monumental scale. Teaming with the aerospace industry and university research groups, NASA developed a broad base for manned space activities,





Shown on its initial launch in April 1983, the Space Shuttle Orbiter Challenger symbolizes NASA's broadened capability for exploiting the promise of space.

have been literally thousands of such spinoffs, some of them only incremental improvements in products or processes, many of them important advances of substantial economic value. Collectively, they add up to significant bonuses in public convenience, human welfare, industrial efficiency and economic gain.

There is another, broader type of spinoff. The extraordinary demands of aerospace programs reach into virtually every scientific and technological discipline, spurring innovation in those fields to meet the aerospace need. Sometimes these aerospace-inspired innovations trigger momentous advances in other areas of technology, to the benefit of industry and the national economy. For example, development of sophisticated space systems demanded ever smaller but ever more capable microcircuitry, taxing to the hilt the ingenuity of electronic components designers. But they met the challenge of space miniaturization and, in so doing, were projected into explosive technological advance and multidirectional market expansion. Thus, the impetus of aerospace requirements generated a parallel thrust in non-aerospace microelectronics that resulted in a broad range of new applications from home computers to video games to computerized medical systems.

Perhaps the greatest gain of all is the significantly expanded technology base built by the government/industry/university team during NASA's first quarter century of aerospace effort, a new and broader plateau of technical capability that offers promise of even more dramatic achievements, even more rewarding applications in the years to come.

pioneered the use of space to expand human knowledge and concentrated much of its effort on generating direct public benefit. Simultaneously, the agency conducted a highly productive aeronautical research and technology effort.

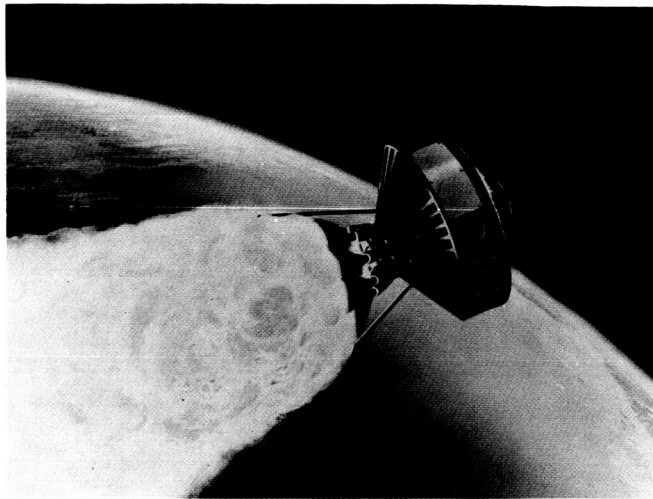
The operational weather and communications satellites now routinely serving the world's peoples trace their lineage to NASA's trailblazing work—in the early 1960s—on space "applications," systems designed to provide direct benefit. More recent applications include a remote sensing system for better management of Earth's far from limitless resources and a life-saving system for improved international search and rescue operations. Projects now under way offer promise of future benefit in such areas as better protection of Earth's environment through improved understanding of near-Earth space, and manufacture in orbit of superior products that cannot be produced on Earth.

In space science, NASA successfully operated scores of spacecraft that investigated the near-Earth environs, explored the moon, probed the far reaches of the solar system and looked beyond, to incalculably distant galaxies. The vast fund of scientific knowledge

thus acquired is among the most important benefits of space research, although perhaps the least understood. It is a benefit in itself: knowledge, an immensely valuable commodity to any society. It is also a practical benefit, a resource for tomorrow's employment, because science is the wellspring of technology; much of the knowledge generated will eventually find practical application in advancing technology.

In its aeronautical program, NASA probed the frontiers of atmospheric flight and produced a lengthy succession of technological advances that contributed to U.S. world leadership in aviation. This part of the NASA effort benefits Americans in many ways. It helps U.S. manufacturers build more efficient commercial aircraft, with attendant benefit to the U.S. economy; it contributes to strengthened national defense; it helps reduce the costs of flight to airlines, their passengers and shippers; it makes flight safer for all airplane users; and it eases the environmental impact of the airplane.

Technology from all these programs—space science, applications and aeronautical research—has spun off in secondary uses over a broad spectrum of public benefits. There

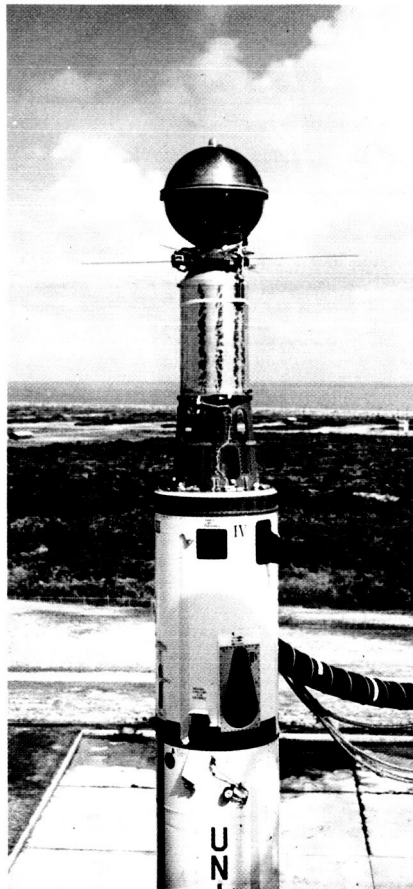


1958

The newly formed NASA launched its first spacecraft, Pioneer 1, which failed to reach the moon but climbed to a record altitude of more than 70,000 miles. Pioneer 1 was the forerunner of a highly successful family of solar orbiting probes that explored interplanetary space.

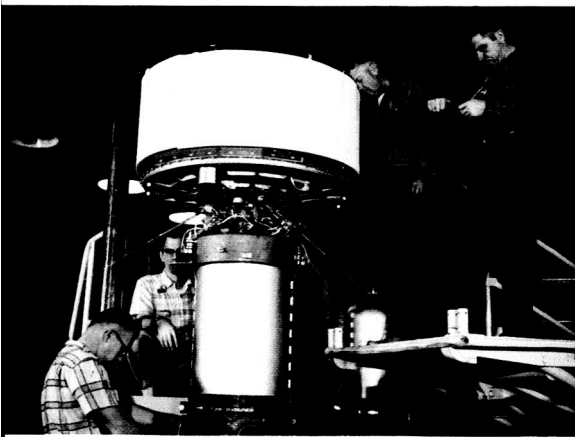
1960

Tiros 1, the first experimental meteorological satellite, introduced photography of Earth's cloud cover from orbit, providing a new informational input that greatly increased the accuracy of weather forecasting. A series of Tiros satellites helped refine photographic quality, transmission techniques and ground processing procedures, paving the way for today's operational meteorological and environmental satellites.



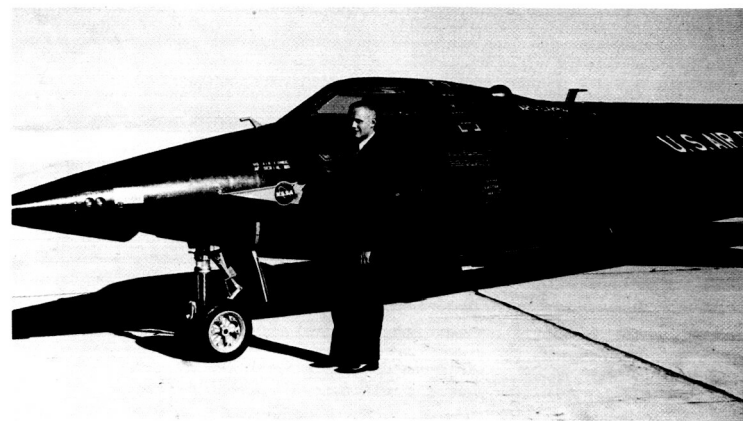
1960

Packed inside a spherical canister and unfolded in space to 100-foot diameter, Echo 1 was the first of two balloon satellites, experiments in reflecting radio signals to relay communications between two points on Earth. Visible to the naked eye, Echo 1 stimulated interest in space on the part of millions around the world who viewed it.



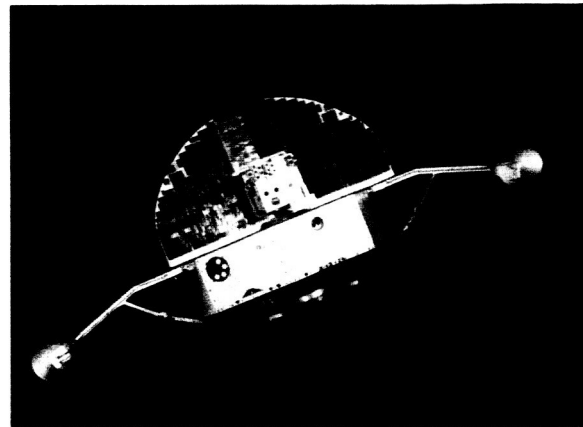
1960

NASA began flight tests of the X-15 rocket-powered research airplane that continued throughout the 1960s. The X-15 provided scientific data from altitudes of more than 40 miles, where man had never been before, and topped 4,500 miles per hour, the fastest a winged vehicle had ever flown. With the X-15 in this photo is one of its pilots, who later became the first man to set foot on the moon—Neil A. Armstrong.



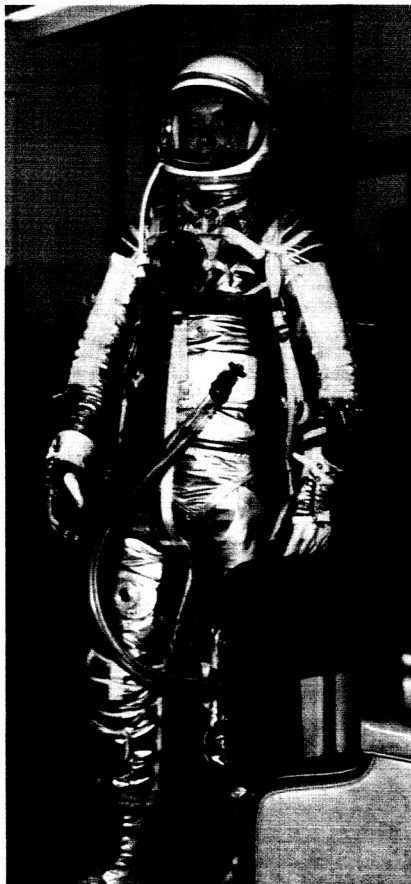
1961

Perched atop the Mercury Redstone 3 launch vehicle is the *Freedom 7* manned capsule that inaugurated U.S. manned space flight only 23 days after the Soviets orbited the first cosmonaut. Alan B. Shepard's suborbital flight of 15½ minutes duration was hailed as a momentous achievement and a sign that the Soviet space lead was narrowing.



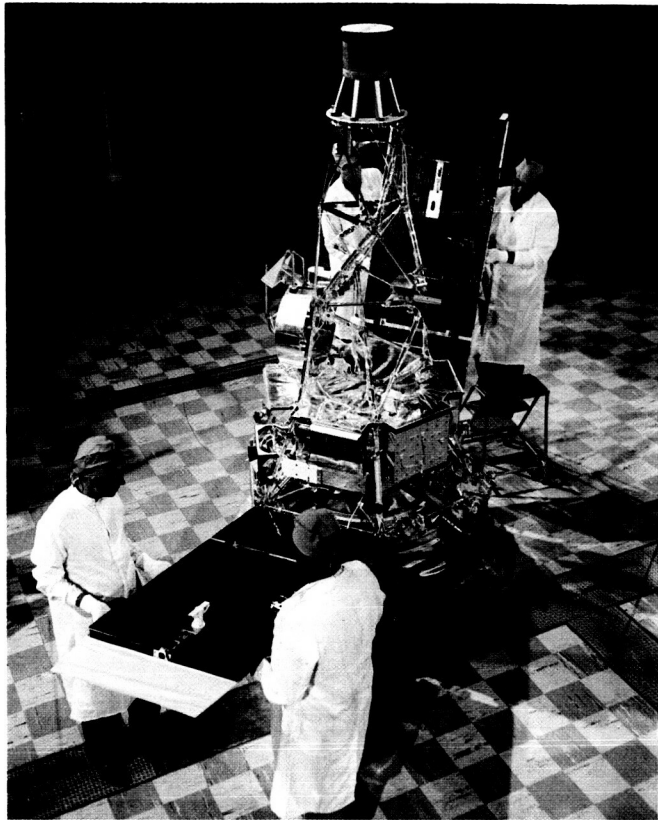
1962

Astronaut John Glenn is shown preparing to board his Mercury spacecraft *Friendship 7* for the first U.S. manned orbital flight, three orbits, five hours. Project Mercury involved six highly successful one-man flights over a two-year span; it provided a strong technological and managerial base for the greater manned space efforts to come.



1962

With OSO-1, NASA initiated a series of six Orbiting Solar Observatories for continuous monitoring of the physical processes taking place on the Sun and the various types of solar radiation emitted. OSO-1 was the first of the "observatory class" satellites operated during the 1960s and well into the 1970s; large, multi-instrument spacecraft for comprehensive solar, geophysical and astronomical studies, they represented a major advance in NASA's capability for gathering scientific data.

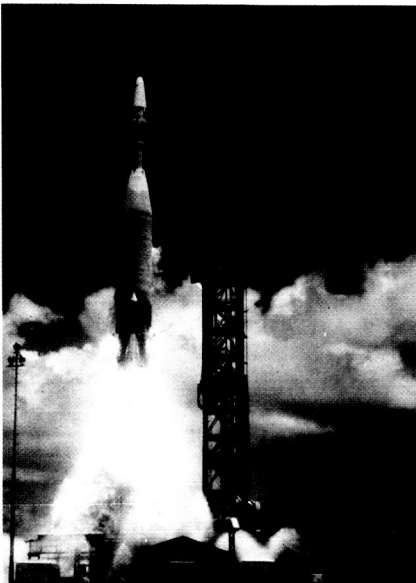
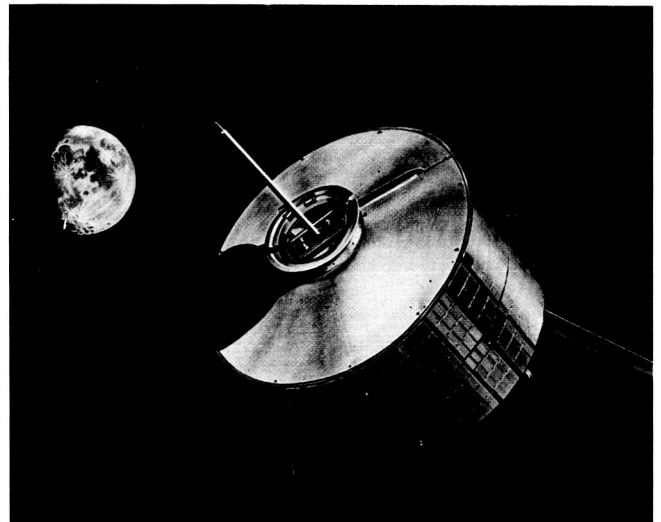


1962

Pictured in final fabrication status, Mariner 2 scored a major U.S. triumph in the space competition with the Soviet Union: it was the first successful planetary probe. It traveled 48 million miles to Venus, passed within 22,000 miles of the planet, and its instruments measured Venus' atmosphere, surface temperature and other phenomena. In 1965, Mariner 4 returned pictures of Mars, the first closeup views of another planet.

1963

Early communications satellites operated in low Earth orbit, hence could transmit signals only when "in view" of a ground station. For full 24-hour service, satellites had to operate in synchronous orbit 22,300 miles high. That required a big advance in space technology. NASA accomplished it with Syncom 2 (pictured) and Syncom 3, establishing the basic principles for design and operation of synchronous satellites and building a foundation for the commercial communications satellite networks that followed.

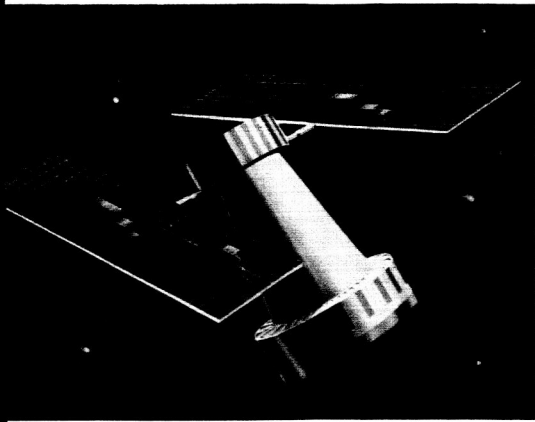


1964

The launch of Ranger 7 marked a turning point in NASA's trouble-plagued Ranger program, objective of which was to acquire closeup photos of the moon's surface as a preliminary step toward manned landings. After six prior failures, three Ranger spacecraft returned more than 17,000 views of possible landing sites.

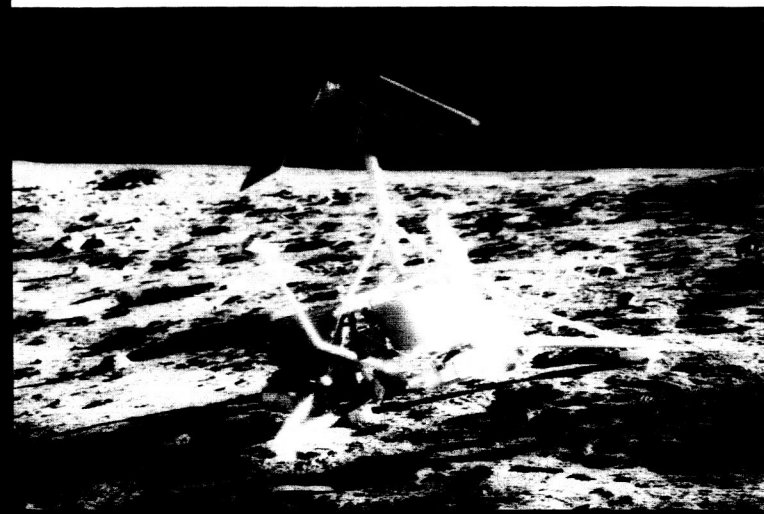
1964

In its continuing effort to develop advanced technology for weather satellites, NASA launched the first of several Nimbus spacecraft. Nimbus had an improved camera system, a radiometer for taking cloud cover photos at night and instruments for atmospheric measurements, all improvements over the earlier Tiros satellites.



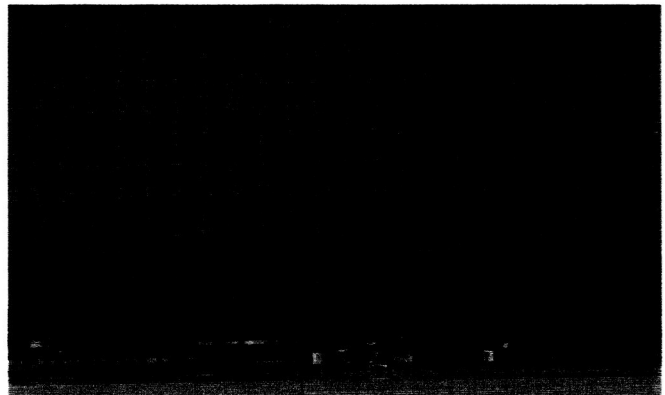
1966

The photo below shows Surveyor on the moon, the first U.S. landing on another celestial body; it was taken by Apollo astronauts who visited the site four years later. Surveyor photographed the moon from surface level and conducted experiments to demonstrate that the surface would support a manned spacecraft. Surveyor's companion was the Lunar Orbiter, which photographed the moon from orbit. In 11 successful flights (six Orbiters, five Surveyors) the two spacecraft returned thousands of photos for use in selecting Apollo landing sites.



1965

Another first—a picture of Gemini 7 taken from Gemini 6, the first photograph of an orbiting spacecraft, made during the first rendezvous between two spacecraft. Along with the first U.S. spacewalk, the rendezvous was a highlight of the 1965–66 Gemini program, in which two-man crews flew 10 successful missions.

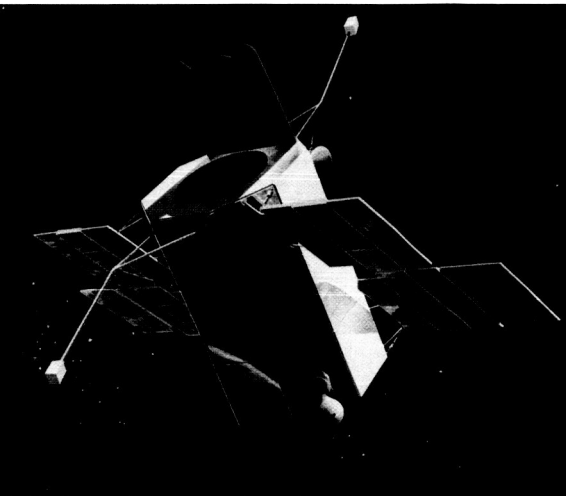
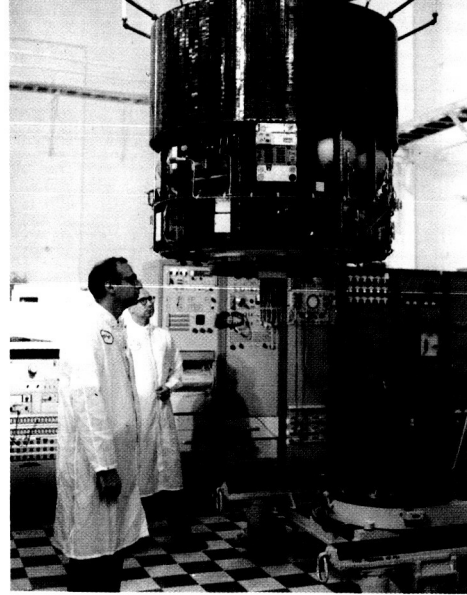


1966

NASA began a six-year program of research on "lifting body" vehicles such as the M2F2 shown, the first to fly among several craft in the program. Lifting body vehicles have no wings but derive lift from body contours and aerodynamic control surfaces. The program provided data toward design of hypersonic aircraft and Earth re-entering spacecraft like the Space Shuttle Orbiter.

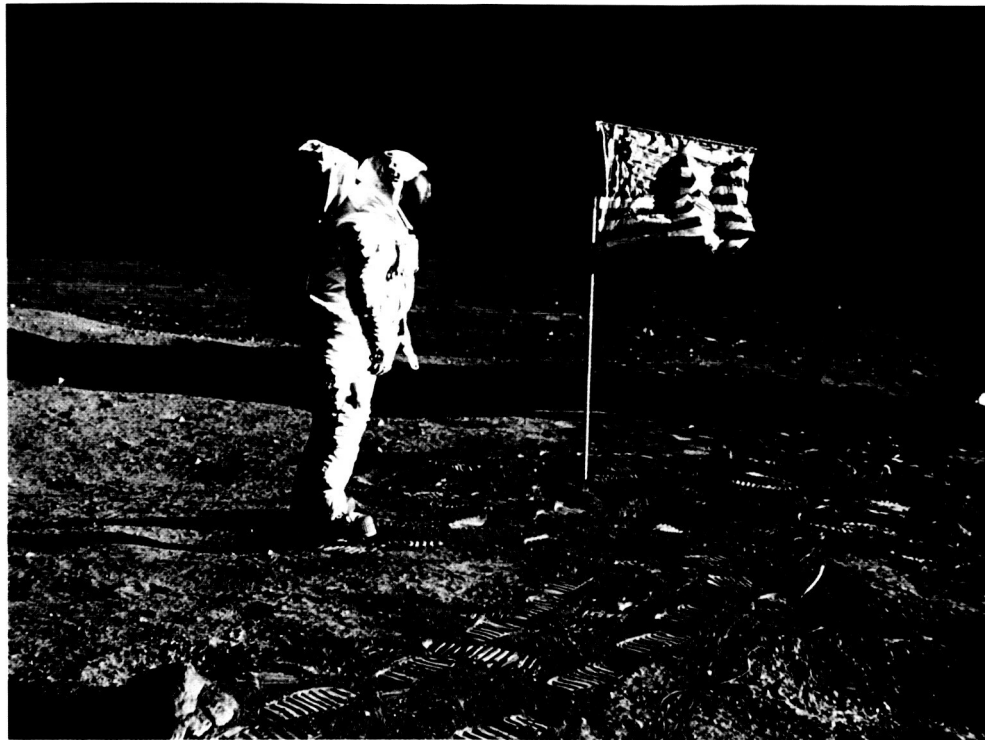
1966

Shown undergoing pre-launch checkout, ATS-1 was the first of six Applications Technology Satellites launched during 1966–74 to provide orbital information toward developing technology for “applications” spacecraft, those designed to provide direct Earth benefit. The first five ATS made a comprehensive study of the synchronous orbit environment and tested a variety of experimental devices. ATS-6 conducted many demonstrations of direct broadcasting, pioneering a communications technique that is growing rapidly today.



1968

OAO-2 was the first of two successful Orbiting Astronomical Observatories; its companion, OAO-3 or *Copernicus*, was launched four years later. These big observatory class satellites, weighing well over two tons, brought a new dimension to space astronomy; with their arrays of sensitive instruments and extremely precise star-pointing systems, they provided volumes of new data about the stars and galaxies.



1969

This historic photo depicts one of the proudest moments in the history of the United States: the planting of the American flag on the moon, witnessed live or in delayed telecast by two-thirds of the world's people. The astronaut pictured is Edwin E. Aldrin; photo by Neil A. Armstrong. The flag speaks eloquently of the Apollo program's contribution to American prestige, as do the footprints in the lunar dust—all the footprints ever made on the moon were American-made.

In 1968–72, there were 11 manned Apollo flights involving 29 astronauts, 12 of whom walked on

the moon; there were two manned Earth orbital preliminaries, three circumlunar flights and six lunar landing missions. Apollo was man's greatest feat of exploration, a monumental triumph of American scientific and technological prowess. It firmly reestablished the United States as world technological leader and restored an earlier-tarnished national reputation; it generated major advances across a wide spectrum of scientific disciplines; and it demanded technological giant steps whose accomplishment elevated the nation to a new plateau of capability.

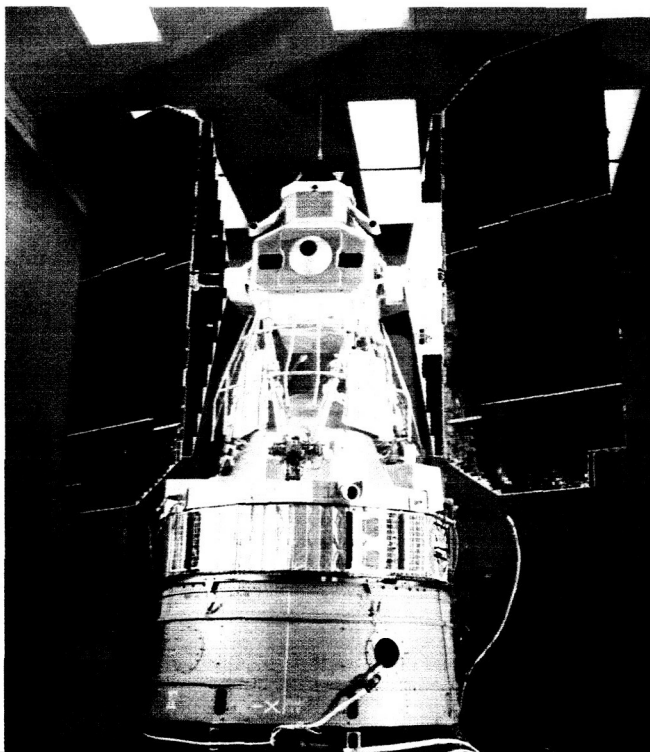
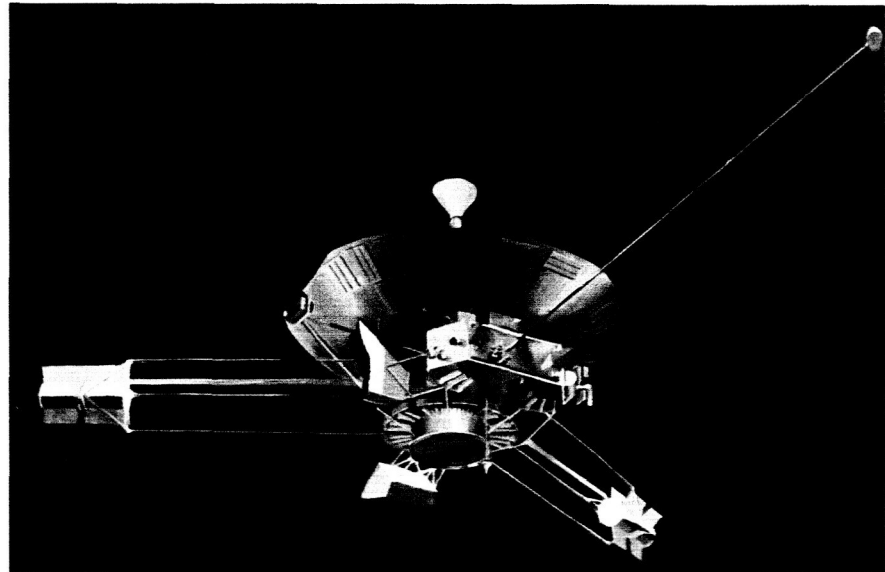


1971

Dr. Richard T. Whitcomb of Langley Research Center examines a wind tunnel model fitted with a "supercritical" wing, an advanced airfoil that has a different shape: it is flattened on the upper surface and the trailing edge curves downward. These design features delay the buildup of air drag at high speeds, allowing an airplane to fly faster or farther for the same amount of fuel. Whitcomb and his Langley associates developed a whole family of supercritical wings for various types of aircraft. Now finding wide acceptance, the technology is considered one of the most important recent advances in aerodynamics.

1972

Pioneer 10 departed Earth, with Pioneer 11 a year behind, on man's first attempts to send automated vehicles beyond the solar system. The two interplanetary explorers sent back data and photos of Jupiter and Saturn, then continued onward toward infinity. Eleven years out of home port Earth, and still returning data, Pioneer 10 is now at the edge of the solar system; Pioneer 11 is not far behind. They will leave the solar system to roam for millions of years, perhaps forever, in intergalactic space.

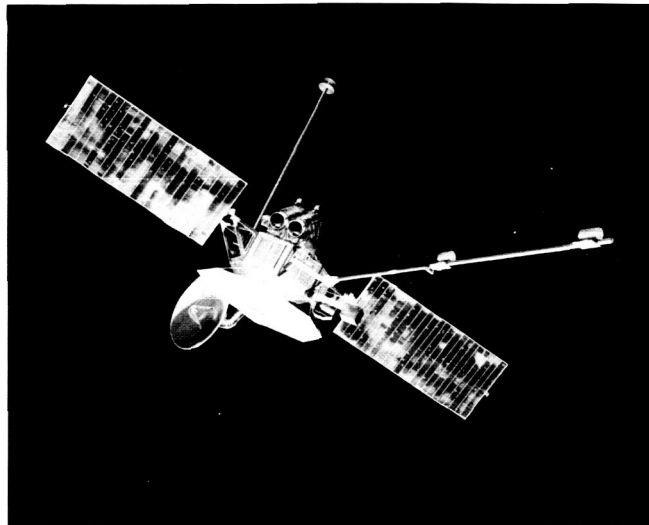
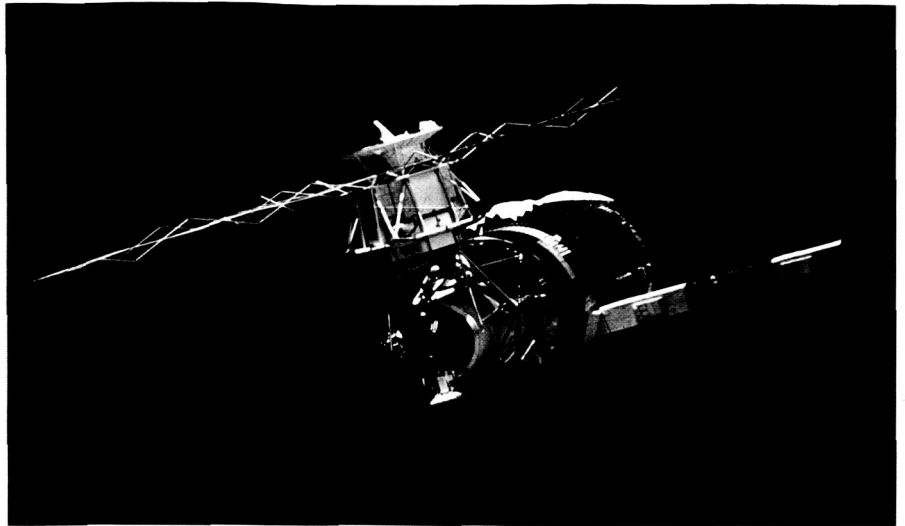


1972

Landsat 1 was the first of four Earth resources survey satellites, each more advanced than its predecessor, launched in 1972-82. Equipped with cameras and sensors, they offer a means of monitoring changing conditions on Earth's surface for practical benefit in such applications as agricultural crop forecasting, mineral and petroleum exploration, forest management, mapping, land use management, water quality evaluation and disaster assessment. NASA's development and interim operation of the Landsats built a foundation for a possible commercial system with enormous potential benefit in improved management of Earth's resources.

1973

Skylab was an interim space station, a large manned orbiting laboratory that included the most powerful telescope ever orbited, a furnace for experiments in space materials processing, and a broad array of scientific instruments. Three three-man crews manned the station in 1973–74 for stays of 28, 59 and 84 days. Skylab provided important medical data on the effects of long duration weightlessness; a great amount of invaluable astronomical and Earth resources data; and a technology base for planning a permanent space station.

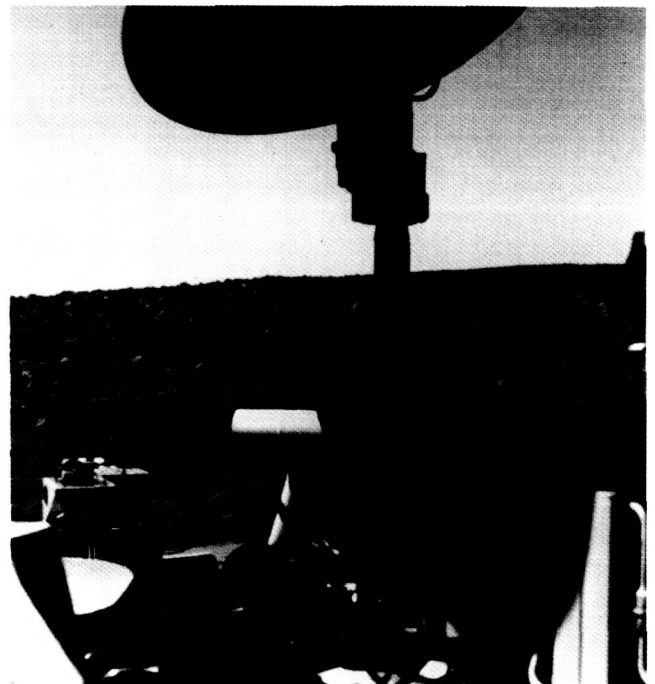


1973

Another first—Mariner 10 provided the first closeup views of Mercury, smallest of the solar system's nine planets and the most difficult to observe from ground-based telescopes because it is close to the Sun. En route to Mercury, the spacecraft flew by Venus, adding new volumes of information on that planet. It marked the first time a space probe visited two planets on a single mission.

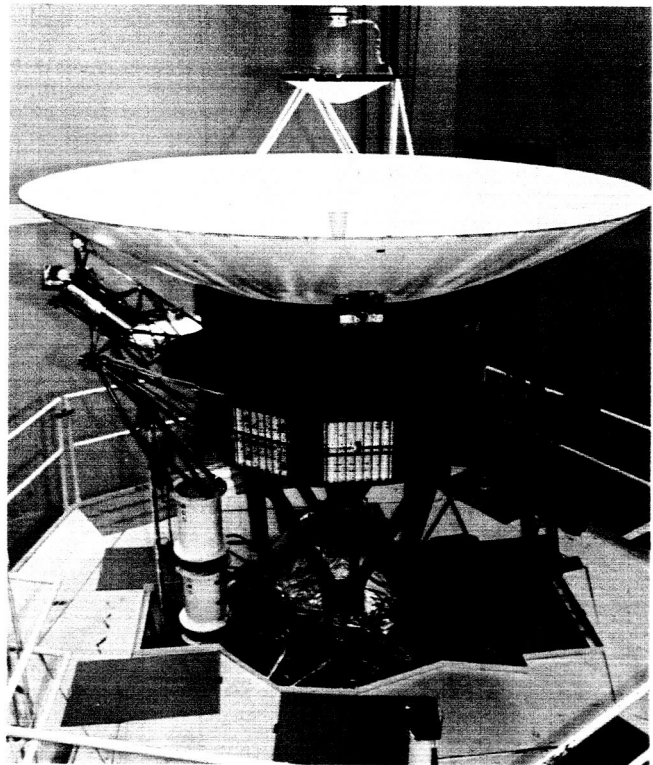
1976

A technological triumph of Apollo-like dimension, the Viking program involved landing two spacecraft on Mars, 40 million miles distant, and putting two others in orbit around the Red Planet. The Orbiters mapped the Martian surface and relayed communications from the Landers, which took photos of the surface, sampled the soil and the atmosphere, and conducted a search for extraterrestrial life signs.



1977

Shown undergoing prelaunch vibration testing is one of two Voyager spacecraft that returned tens of thousands of photos and countless volumes of scientific data on Jupiter and Saturn during their grand tour of the solar system. Voyager 2 is en route to encounters—in the latter 1980s—with Uranus and Neptune, neither ever visited by spacecraft. The exciting odyssey of the Voyagers underscores the extraordinary reach NASA has attained in its first quarter century.



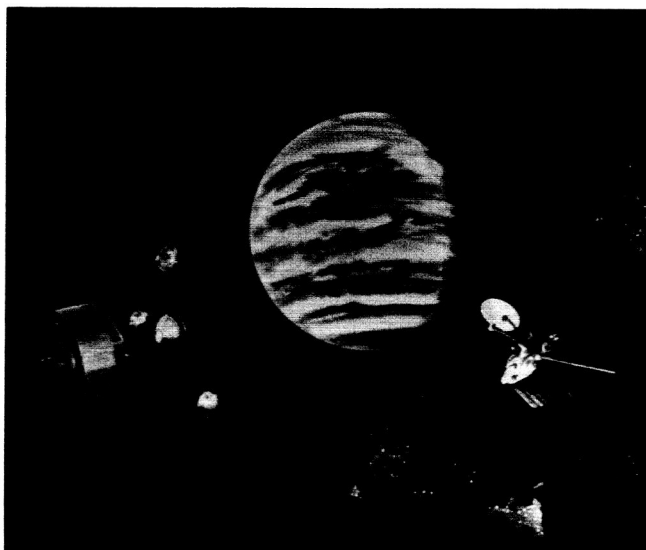
1978

Representative of many technology advances accomplished in NASA's Aircraft Energy Efficiency (ACEE) program, the winglet pictured is an aerodynamic innovation designed to improve fuel consumption and generally improve airplane performance. ACEE is generating new technology in aerodynamics, propulsion, structures and control systems; some advances have already been incorporated in new civil and military aircraft.



1978

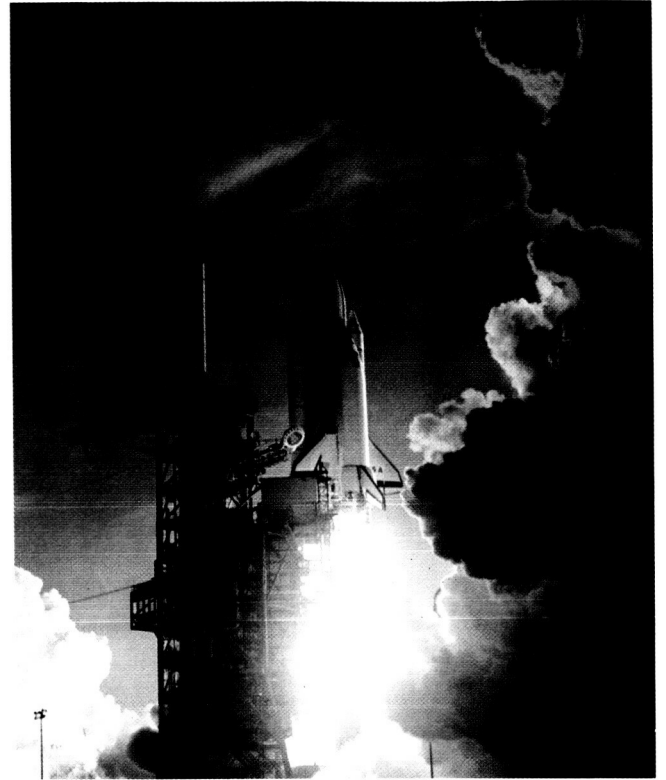
The illustration shows the two separate elements of the Pioneer Venus spacecraft team, at left the "multiprobe" that reported data while descending through Venus' atmosphere and, at right, the Venus Orbiter that mapped nearly all of the planet's never-seen surface. The Pioneer Venus program provided important data about Earth's closest planetary neighbor, information that offers clues to greater understanding of Earth's own environment and how to protect it.





1978

NASA began flight tests of the Quiet Short-haul Research Aircraft (QSRA), which is demonstrating technology for solution of two major aviation problems—airport congestion and aircraft noise. A “propulsive lift” technique permits the QSRA to climb and descend at steep angles and operate from very short runways; design factors and soundproofing make the QSRA extremely quiet. The experimental craft is a pathfinder for future short-haul transports operating from close-to-city airports, which would alleviate congestion at major terminals.



1981

A major milestone—the Space Shuttle *Columbia* lifts off the pad at Kennedy Space Center on its maiden voyage, ushering in a new era of U.S. capability, an era of operational regularity and expanded opportunities for the practical benefits space promises.



1983

Launch of the Infrared Astronomical Satellite (IRAS), shown being prepared for flight, inaugurated NASA’s silver anniversary year. IRAS is making an immense contribution to astronomical science by detecting “cold” objects that do not shine in visible light but emit radiation in the infrared wavelengths. Its sensitive instruments have discovered stars being born, stars dying, and galaxies so small and so distant they have been viewed only dimly before, some not at all.

1983

STS-7 View From SPAS-01. This photograph of the STS-7 orbiter *Challenger* was taken from the Shuttle Pallet Satellite (SPAS-01) on June 22, 1983. The exposure was made while SPAS-01 was flying in formation with STS-7, providing the first picture of a Space Shuttle in Earth orbit to be taken from a second orbiting spacecraft.

The Canadian-built Remote Manipulator System (RMS), the pallet for OSTA-02, the empty Telsat Anik C-2 communications satellite cradle, the vacant Indonesian Palapa B satellite cradle near the aft bulkhead, the Ku-band antenna deployed near the forward bulkhead, and a number of Getaway Special (GAS) cannisters can be seen in this remarkable photograph.

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